

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Applicant: Tatsumi et al. Serial No.: unknown
Filed: concurrent herewith Docket No.: 12109.44US01
Title: ADSORBENT, ADSORPTION COLUMN AND APPARATUS FOR
PRESSURE SWING ADSORPTION SEPARATION

CERTIFICATE UNDER 37 CFR 1.10

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By: Yolanda Gray

Name: Yolanda Gray

PRELIMINARY AMENDMENT

Assistant Commissioner for Patents
Washington, D. C. 20231

Dear Sir:

In connection with the above-identified application filed herewith, please enter the following preliminary amendment:

IN THE CLAIMS

Please amend claims 3-5 and 12 as follows:

3. (amended) The adsorbent according to claim 1, wherein said multi-component gas mixture is air and said objective component gas is oxygen.

4. (amended) The adsorbent according to claim 1, wherein said adsorbent is one of a Ca-A type zeolite, a Na-X type zeolite or a zeolite where at least a part of Na of said Na-X type zeolite is ion-exchanged by Ca, Mg or Li.

5. (amended) The adsorbent according to claim 1, wherein said pressure swing adsorption separation process includes a vacuum regeneration process.

12. (amended) A pressure swing adsorption separation apparatus, said apparatus provided with said adsorption column according to claim 6.

Please add new claims 13-15 as follows:

13. (new) The adsorbent according to claim 2, wherein said multi-component gas mixture is air and said objective component gas is oxygen.

14. (new) The adsorbent according to claim 2, wherein said adsorbent is one of a Ca-A type zeolite, a Na-X type zeolite or a zeolite where at least a part of Na of said Na-X type zeolite is ion-exchanged by Ca, Mg or Li.

15. (new) The adsorbent according to claim 2, wherein said pressure swing adsorption separation process includes a vacuum regeneration process.

REMARKS

The above preliminary amendment is made to remove multiple dependencies from claims 3-5 and 12 and to add new claims 13-15. A marked-up version of the claims is attached.

Applicants respectfully request that the preliminary amendment described herein be entered into the record prior to calculation of the filing fee and prior to examination and consideration of the above-identified application.

If a telephone conference would be helpful in resolving any issues concerning this communication, please contact Applicants' primary attorney-of record, Curtis B. Hamre (Reg. No. 29,165), at (612) 336.4722.

Respectfully submitted,

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Dated: May 15, 2001

By Curtis B. Hamre
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CBH/sef/jlc

What is claimed is:

1. An adsorbent for a pressure swing adsorption separation, to be used for separating and collecting an objective component gas from a multi-component gas mixture by said pressure swing adsorption separation process, said adsorbent comprising:

particles having a size

wherein said size of said particles of said adsorbent is established such that a diameter in case of said particles of said adsorbent having a spherical shape, or an equivalent diameter in case of said particles of said adsorbent having a cylindrical shape, an elliptic spherical shape or an elliptic cylindrical shape is set to be within a range of 1.0 ± 0.2 mm.

2. An adsorbent for a pressure swing adsorption separation, to be used for separating and collecting an objective component gas from a multi-component gas mixture by said pressure swing adsorption separation process, said adsorbent comprising:

particles

wherein said particles of the said adsorbent having a particle diameter distribution within a range from 12 mesh to 20 mesh are contained at least more than 70% in said adsorbent when said particle diameter distribution of said particles of said adsorbent is measured by a tyler standard sieve.

3. The adsorbent according to claim 1 [or 2], wherein said multi-component gas mixture is air and said objective component gas is oxygen.

4. The adsorbent according to claim 1 [or 2] wherein said adsorbent is one of a Ca-A type zeolite, a Na-X type zeolite or a zeolite where at least a part of Na of said Na-X type zeolite is ion-exchanged by Ca, Mg or Li.

5. The adsorbent according to claim 1 [or 2] wherein said pressure

swing adsorption separation process includes a vacuum regeneration process.

6. An adsorption column for a pressure swing adsorption separation column, packed with an adsorbent for separating and collecting an objective component gas from a multi-component gas mixture by a pressure swing adsorption separation process, said adsorption column comprising:

said adsorbent comprising particles having a size

wherein said size of said particles of said adsorbent is established such that a diameter in case of said particles of said adsorbent having a spherical shape, or an equivalent diameter in case of said particles of said adsorbent having a cylindrical shape, an elliptic spherical shape or an elliptic cylindrical shape, is supposed to be a [mm], and a superficial velocity u [m/s] is set to be within a range of $\pm 25\%$ of $u = 0.07a + 0.095$.

7. The adsorption column according to claim 6, wherein said diameter a or said equivalent diameter a of said adsorbent is in a range of 1.0 ± 0.2 mm.

8. The adsorption column according to claim 6, wherein said particles of said adsorbent having a particle diameter distribution within a range from 12 mesh to 20 mesh are contained at least more than 70% in said adsorbent when said particle diameter distribution of said particles of said adsorbent is measured by a tyler standard sieve.

9. The adsorption column according to claim 6, wherein said multi-component gas mixture is air and said objective component gas is oxygen.

10. The adsorption column according to claim 6, wherein said adsorbent is one of a Ca-A type zeolite, a Na-X type zeolite or a zeolite where at least a part of Na of said Na-X type zeolite is ion-exchanged by Ca,

Mg or Li.

11. The adsorption column according to claim 6, wherein said pressure swing adsorption separation process includes a vacuum regeneration process.

- 5 12. A pressure swing adsorption separation apparatus, said apparatus provided with said adsorption column according to [one of claims 6 to 11].

--claim 6--